Quendall Terminals Superfund Site
STAR Bench-Scale Treatability Study Conference Call
February 9, 2018
Draft Call Summary

Attendees

Kathy Cerise	EPA Region 10 Quendall Remedial Project Manager
Jim Cummings	EPA Technology Assessment
Eva Davis	EPA R.S. Kerr Environmental Research Center
Rene Fuentes	EPA Region 10 Senior Hydrogeologist
Gavin Grant	Savron Operations Manager
Laura Kinsman	Savron Project Manager
Suzanne O'Hara	Geosyntec Senior Geologist
Jason Cole	CH2M Senior Remediation Technologist
Susan Moore	CH2M Quendall Project Manager

ITEMS DISCUSSED

Introductions/Agenda Review

The meeting began with team introductions and review of the agenda.

Current Quendall Project Status

- Kathy provided the following update: Working on Proposed Plan now—would rather have this up front. Due May 15.
    - Identified Alternative 7a—adding STAR as potential treatment (in addition to ISS)
    - Likely (awaiting director approval):
        - Implement a combination of STAR and ISS
        - Divide the site into to operable units(OUs)
        - Issue two RODs
- Today, focus on bench-scale test QAPP.

Overview of Bench-Scale TS and Data Quality Objectives

- Susan provided overview: The purpose of bench-scale TS is to determine if STAR viable in the upland area. This is a two-part evaluation, with the first being performed in the laboratory, and the second being performed in the field at pilot scale.
- In the laboratory, we're gaining an understanding of the conditions necessary for design of STAR in the field, if successful:
    - Peak combustion temp
    - Gas emissions (for design of vapor treatment)
    - Degree of combustion (measurement of pre- and post-treatment PAH and TPH concentrations)
- Samples will be collected with an excavator from two areas for the Bench-Scale TS:
    - Creosote-impacted sample: Eastern portion of the site near railroad. There are multiple layers of product.
    - Coal-tar impacted sample (higher benzene sample): Closer to water where feedstock was unloaded. There is a single string of contamination in this location.

- Only the top layer will be sampled given the shallow water table (~10-12 feet).
- Testing will proceed per Savron's SOP.

Preliminary EPA Comments/Questions on the Bench-Scale TS QAPP

- What are the testing performance standards for determining if STAR is successful? (Eva)
    - (Susan) For the Bench Test, we're looking for:
        - reduction of PAH and TPH concentrations
        - evidence that there is self-sustaining combustion reaction (when the heat source is turned off, the heat generated through combustion is enough to sustain combustion of adjacent [or closely located] product).
- What kind of PAH/TPH reductions are indicative of successful performance? (Eva)
    - (Gavin) There is no set concentration unless the engineering team has some site-specific target for treatment. The organic concentrations are usually below detection post-treatment.
- There are several layers in the formation; how will a homogenized material represent the field? (Rene)
    - (Gavin/Jason): This cannot be adequately addressed in a laboratory setting; the bench-test can't capture that heterogeneity with certainty. It is a two-step evaluation:
        - Laboratory: are the physical and chemical properties of the coal tar suitable for use? Site materials ok?
        - Field: Can the smoldering proceed under the complex heterogeneity? What can we expect for propagation rates and radius of influence?
    - *Rene wants to make it clear that this is a two-part evaluation, that if we have a successful bench test, it does not necessarily mean that this will be successful at the field.*
- Could the bench test give a false negative at the bench-scale? (Eva)
    - (Gavin) Yes—heat losses are much greater in the laboratory, and there is a finite wall for continuing the process. It is harder to sustain the reaction in the laboratory, so if it is successful in the lab, it gives greater confidence for the field.
- Concern that there are small quantities of soil that are tested. (Eva)
    - (Gavin) The column is 15 cm diameter, and a minimum 12 cm in height (usually 18-20 cm). This is sufficient for the purposes of the laboratory study.
- Does bulk density of the soil matter? (Rene)
    - (Gavin) Yes, it effects propagation rates. Tighter packing leads to lower permeability and slower propagation rates. The soil is packed tightly in the laboratory, but it is still less than in the field. This is another reason why the pilot study is necessary (to measure in-situ propagation rates).
- There are some discrepancies between main document and Appendix A in what the off-gas will be analyzed for. (Eva)
    - *(Susan) Note: carbon sulfide should be carbonyl sulfide. The main body is correct, but needs to be carried over to Appendix A.*
    - (Gavin) The gasses are tested for combustion gasses (CO and CO_2) to measure the strength of combustion and VOCs to anticipate what will be seen in the field to design vapor treatment system.
- Are PAHs analyzed in the gas? (Eva)
    - (Susan/Gavin/Jason) They are not typically seen, but some of the lighter PAHs are included in TO-15.

- *Eva would like to be directed to the place in the RI report where the composition of the PAHs at these locations are tabulated. Susan will provide.*

- Comment: Homogenization is less than ideal, but it provides information for the pilot. Designing the pilot is going to take more complex planning due to the NAPL architecture – the field work is where this is going to come to an intellectual head (Jim).
- Why not do the test on a split-spoon or Shelby tube sample with a vertical profile? (Rene)
  - (Gavin/Susan) With a 15-cm diameter column, it would be difficult to get this sample. Even if we did:
    - The laboratory test is performed vertically, while the field test propagates horizontally.
    - The subsurface is complex; whatever layering is in this small column is not going to give adequate information on the feasibility of testing, especially noting the difference in propagation rates and heat losses between the bench-top study and the field.
  - Samples are homogenized to get a good mix of soil types in that zone (fine and coarser grain soil).
- Why was it not proposed to measure the fuel content of NAPL? Why does the soil type/texture matter? (Eva)
  - (Galvin) Self-sustainability depends on several things. Though NAPL (fuel) content is important, permeability and soil type/texture play a large factor.
  - The soil serves as a heat exchanger, taking energy from the combustion reactions and transferring them to uncombusted material to heat them. If the soil has components that are volatile, it takes energy out of the system. Likewise, larger-grained sands store more heat on the internal portion of the grain, removing it from the system. Low grain size soils are less permeable and may quench the reaction by not allowing enough air flow.
  - Soil with high carbon content *may* provide some help as well.
  - NAPL has the highest concentrations in the sandy layers (storage capacity and wetting).
- Do the organic sandy silts have enough contamination or material to support combustion? (Jim)
  - (Susan) There is a fairly high carbon content in these deltaic deposits, but as stated, the contamination tends to be in the sandier soil.
- Are the bench-scale results considered low-end results; that is, is it expected to work better in the field? (Rene)
  - (Gavin) It is difficult to say. You are more likely to have self-sustaining smoldering in the field, but there is more heterogeneity.
- *Susan indicated that she could create a packet of pertinent pictures/tables from the RI/FS to distribute to the team before calls as it is difficult to stay on the same page with such large files.*
- It may be beneficial to evaluate if injecting vegetable oil would help. (Jim)
  - The "meadow mat" evaluated for Pitt Consol was too clayey; may have enough material, but not air permeable.

Preliminary PDE Discussion

- Susan provided a summary of the PDE development to date. She noted that boring logs from the PRP RI investigation in 2009 were used to interpret where NAPL was present (adopted Thiessen polygons centered on the borings). Focus of RI/FS was to identify and target DNAPL source materials in upland areas to reduce groundwater impacts. The PRPs distinguished between oil-coated (OC) and oil-wetted (OW) materials. EPA selected FS Alternative 7 = footprint for

treatment for OC or OW material with the idea of treating or isolating as much of the source material that is known.

- What information is necessary for Savron to design a full-scale implementation (spatially), and if multiple intervals can be ignited from a single boring? How does the RI data compare/contrast to information Savron has had in previous pilot tests? We will need to discuss the process by which this is approached. (Jim)
    - (Gavin): At Pitt Consol, did a statistical analysis with cost-benefit analysis to decide the spacing of their TarGOST. They did 3D interpolation with EVS and based their design on that information (number of ignition points, number of distinct layers that would require treatment, the length of wells and multilevel thermocouples, etc.). There was always a geologist onsite to define the screening intervals for the installed wells. Each different ignition point required a new boring.
- When you go to pilot, do you aim at where it's likely to work, or where it's questionable? (Eva)
    - (Gavin) Savron looks for a place where treatment is challenging for STAR and other technologies, but in an area where STAR will be used. They look at propagation rates and radius of influence (key cost drivers for STAR).
    - (Jim) The main challenge is how to identify volumes and concentrations that are appropriate and distinguish from where it's not. The pilot will not be able to define a 'minimum' concentration at the location due to the heterogeneity.
- If we know the minimum threshold concentration, we could use the characterization data to target where STAR would be successful. (Eva)
    - (Susan) The treatment goal is to just treat OC and OW materials in the upland. Since we're targeting product, the combustion will follow the contamination. It will pinch, grow, and spider out. We do not have data needed to make a determination of the minimum threshold.
    - (Gavin) We want to do a pilot where there are laterally-extensive impacts so we can evaluate the radius of influence and can identify the key cost drivers of the full-scale treatment.
- Is there sufficient information to evaluate the effectiveness of treatment in the volumes shown in the Thiessen polygons? We will need to gain wisdom from Savron's experience to figure out how to proceed before the full design. (Jim)
    - (Susan) Based on the data we have, can we do our pilot test, and then can we refine as we install the borings and see what's available?
    - (Gavin) Yes, then we can do some post-treatment evaluations to gain further information.
    - (Susan) And then decide if we need further high-resolution characterization.

Action Items

1. Add text to the TS QAPP to make it clear that this is a two-part evaluation; that if we have a successful bench test, it does not necessarily mean that this will be successful at the field.
2. Provide Eva with the PAH concentrations tabulated in the RI report. *[Done, provided link to this and other data on 2/9/18.]*
3. Ensure the main QAPP text and Appendix A are consistent for the air analyses performed as part of the bench-scale TS.
4. Create a packet of pertinent pictures/tables from the RI/FS to distribute to the team before calls as it is difficult to stay on the same page with such large files.
5. Ensure the BH-30C polygon is filled in with the appropriate color in Figure 2.